APPENDIX I

Characteristics of Local Species

CHARACTERISTICS OF LOCAL SPECIES

WESTERN HEMLOCK *(Tsuga herterophylla)*

The genus *Tsuga* contains about 14 species native to North America [4] and southern and eastern Asia [10]. The word *tsuga* is the Japanese name for the native hemlocks of Japan. The word *heterophylla* means 'with other (different or various) leaves.'

Distribution Western hemlock is the most abundant tree species grown in Alaska. It is native to the Pacific coast region from southern Alaska (Kenai Peninsula) southeast through southeastern Alaska and western British Columbia to western Washington, western Oregon and northwestern California. The species is also found in the Rocky Mountain region from southeastern British Columbia south to northeastern Washington, northern Idaho and northwestern Montana.

The Tree Western hemlock trees reach heights of 200 feet, with diameters of 3 feet. An exceptional specimen was recorded at 259 feet tall, with a diameter of 108 inches.

General Wood Characteristics The heartwood and sapwood of western hemlock are brown with a purplish tinge. Both are light reddish and nearly indistinguishable from each other. The sapwood, which is sometimes lighter in color, is generally not more than 1 inch thick. The wood often contains small, sound, black knots that are usually tight and stay in place. Dark streaks are often found in the lumber; these are caused by hemlock bark maggots and generally do not reduce strength. The wood is moderate in its hardness, stiffness, and shock resistance and has moderately large shrinkage (about the same as Douglas-fir). Green hemlock lumber contains considerably more water than Douglas-fir and requires a longer kiln drying time. Trees may contain wet wood and/or have ring shake.

Working Properties The wood has a fine, moderately even texture, is nonresinous, and is easily machined and worked. The wood is intermediate in nail holding ability and has a tendency to split when nailed. It is satisfactory with respect to being glued and in taking stains, polish, varnish and paint. The wood is easy to work in all hand and machine operations and has little dulling effect on cutting edges. A clean finish can generally be obtained if sharp tools are used which are honed free from wire edges, however, the wood must be supported at the tool exit to prevent chipping out. The wood has a tendency to chip bruising in planing which can be overcome by having an efficient cleanout system which keeps debris from building up in front of the cutter heads. The wood is readily sliced to a smooth silky finish which is advantageous for the manufacture of veneers and plywood. It has good density and fiber length which makes it the most desirable species for making quality pulp and paper.

Durability Western hemlock lumber gives good service in construction, although is classes very low in decay resistance.

Preservation Western hemlock is resistant to preservative treatment.

Uses Early uses of hemlock in Alaska were limited to mine timbers, rough-sawn lumber, house logs, poles and pilings, railroad and mine ties and fuel wood. Since the 1950s, hemlock fibers have been use in the production of specialty dissolving pulp in Southeast Alaska and are among the finest of raw material for this use. West-

ern hemlock is relatively hard and is among the stronger western softwoods. Uses today include framing, architectural members, trim, roof decking, laminating stock, moldings, structural lumber, and veneer for plywood. In comparison with other commonly known construction species, such as Douglas fir, the wood of western hemlock is moderately light in weight, moderately low in shock resistance, and has moderately large shrinkage. Western hemlock is almost tasteless and odorless when seasoned, making it especially well-suited for food containers.

SITKA SPRUCE *(Pincea sitchensis)*

The genus Picea is composed of about 30 species native to North America [12] and Eurasia [20]. The word picea comes from the ancient Latin name (pix, picis = pitch) of a pitchy pine, probably Scotch pine (*Pinus sylvestris* L.). The *sitchensis* is for Sitka Island (now Baranof Island) in southeastern Alaska.

Distribution Sitka spruce is the largest and most valuable tree species in Alaska. It is native to the Pacific Coast region from southern Alaska (Kodiak Island and Cook Inlet), southeast through southeastern Alaska, western British Columbia, western Washington, western Oregon, and northwestern California.

The Tree Sitka spruce trees normally reach heights of 160 feet, with diameters of 5 feet. A record tree was recorded to be 216 feet tall, with a diameter of 16.7 feet.

General Wood Characteristics The sapwood of Sitka spruce is a creamy white to light yellow, while the heartwood is pinkish-yellow to brown. It may be 3-6 inches wide or even wider in young trees. Because of the large size of the tree and its clear trunk, Sitka spruce produces a large proportion of wood with a clear, uniform texture and straight grain. It is moderately light in weight, moderately low in bending and compressive strength, moderately stiff, moderately soft, and moderately low in resistance to shock. On the basis of weight, it rates high in strength properties and can be obtained in clear, straight-grained pieces. It may be classed as good in ability to stay in place, easy to work, very easy to glue, and takes paint and varnish well. It takes nails without splitting and holds them moderately well. It is a good serviceable construction wood, but like all spruces is low in resistance to decay. It has moderately small shrinkage and is not difficult to kiln-dry. Thin panels of Sitka spruce are highly resonant, making them desirable for piano sounding boards.

Working Properties Sitka spruce can be easily worked when free of knots.

Durability Sitka spruce is rated as slightly or nonresistant to heartwood decay.

Preservation Sitka spruce is resistant to preservative treatments under pressure, but can be treated by a water diffusion process.

Uses Alaska's Sitka spruce is a strong and serviceable wood. It excels in many characteristics, especially strength to weight, workability and pulping characteristics. Lumber, pulpwood, sounding boards for high quality pianos, guitar faces, ladders, components for experimental light aircraft, oars, planking, masts and spars for boats, and turbine blades. Sitka spruce slices well and is suitable for veneering. A clean finish is obtained in machining providing tools are sharp. It is an excellent pulpwood with a long fiber and good density. Sitka spruce is also perfectly acceptable as a structural wood. Stress data are known, span tables are published, and applicable grade rules are available.

WESTERN RED CEDAR *(Thuja plicata)*

The genus *Thuja* is composed of about ___ species native to North America [__] and ____ [__]. The word thuja comes from_____. The *plicata* for_____.

The Tree This is the largest of all cedar species and trees can attain heights of 70-130 feet.

General Wood Characteristics The narrow sapwood, usually less than one-inch wide, is almost pure white; the heartwood varies from a dark reddish-brown to light yellow. Both yellow and brown heartwood frequently occur in the same tree and the yellow portion is sometimes mistaken for sapwood. Wood of western cedar has a strongly aromatic or spicy odor and taste characteristic of all the cedars. It is one of the lightest of the commercially important softwoods.

Western Red Cedar's predominate feature is its extreme resistance to decay. It suffers little when exposed to weather without protective covering. Weathering changes its color to a slight driftwood gray with a silvery sheen. It takes paint, stains or varnishes readily and grips them firmly. Rated by the Forest Products Laboratory in the first of three groups in workability with hand tools, it also machines easily to a smooth silken surface. In glueability, it is classed in Group I as a wood that will "glue easily with different glues under a wide range of gluing conditions."

Dimensional stability is another outstanding characteristic of Western Red Cedar. Dried from a green state down to 12-15 percent moisture content, it will shrink only 3.8 percent by volume—at the extreme lower end of the 3.4-6.6 softwood range. Stability and durability properties account for its widespread popularity for siding, shingles and other exterior uses. Western Red Cedar takes nails easily if care is exercised in nail selection; blunt-pointed fasteners are recommended. Its nail-holding ability is good in relation to its light weight.

The insulation value of wood is well known and widely exercised in sheathing, siding, floor and roof decking and other building uses. Western Red Cedar's "K" factor" (thermal conductivity in British thermal units per hour) is just .72—close to the bottom of the .66-.99 range in the softwoods—making it one of the finest wood insulators.

Durability Although the heartwood of Western Red Cedar usually requires no preservative against decay, poles manufactured from the species are commonly butt-treated to forestall deterioration of the sapwood which lacks durability in all species in contact with the ground.

Preservation Western Red Cedar sapwood is easily penetrated by standard commercial preservatives.

Uses Western Red Cedar is regarded by carpenters, contractors, architects, dealers, and home owners as one of the nation's premier siding materials. The exceptional decay resistance of the species, its high dimensional stability and low thermal conductivity account for its immense popularity in bevel or bungalow siding. Moreover, the good nailing qualities and light weight foster ease of handling on the job, speed construction time and cut installation costs. Easily paintable over its smooth, silky surface, it may be finished in stain or paint treatments of any color, shade or tone. Western Red Cedar siding is also manufactured in a variety of patterns to suit any architectural demand and is especially popular for log cabin siding.

Insulation qualities and resistance to decay are also important factors in the use of large quantities of Western Red Cedar for sheathing and subflooring, where moisture frequently gathers as a result of condensation of interior moisture or from the ground in homes without basements. Workability and dimensional stability are additional properties which insure flat, straight subfloors and sheathing. Number three and four common grades are particularly recommended for those hidden members of construction for they furnish ample strength for the purposes involved.

Red Cedar paneling, in either its clear or knotty grades, is sought after by architects and builders throughout the United States due to its exceptional dimensional stability, high insulation factor, and its beautiful color and grain. Matching moldings, casing and base boards are also available in Red Cedar.

Western Red Cedar is also sawn into dimension lumber for use as studs, plates, posts, headers, fires stops and miscellaneous bracing throughout residential construction. Of the lumber produced, upper grade commons lead in volume with some selects, dimension and shop lumber available. Most of the clear lumber, however is run to bevel siding or manufactured into shingles and shakes.

The miscellaneous uses of Western Red Cedar—for exterior and interior purposes and for finish and utility products—are many and as varied as the remarkable versatility of the wood suggests. Outdoor lawn furniture and garden trim such as lattice work, pickets, posts, arbors, pergolas, summer houses, etc. , where exposure to the elements is severe and constant are ideal applications. Interior finish uses include shelving, cedar chests, built-in furniture and cabinets, sash and other household fixtures.

Articles exposed to high humidity or moisture conditions such as in greenhouses, nursery flats, hotbeds, water troughs, feed troughs, irrigation flumes, and rain gutters, demand the extreme decay resistance of Western Red Cedar as do mud sills, silo doors, fence posts, sluices, stop gates and dozens of other industrial and farm uses both large and small. Lower common grades are effective and economical for most miscellaneous purposes.

The light weight of Western Red Cedar suits it admirably for further fabrication into luggage stock, toy manufacture, core stock, theater staging, furniture, etc. It is renowned as the finest native wood available for boat building and the construction of floats and other marine structures.

The natural tapering conformation of Western Red Cedar, its inherent decay resistance and light weight make the species the preferred material for poles the country over. Linemen like the softness of the cedar poles for safety's sake; their climbers penetrate more easily, reducing the danger of missteps.

ALASKA YELLOW CEDAR *(Chamaecyparis nootkatensis)*

The genus *Chamaecyparis* is composed of six species native to Japan, Taiwan, and both coasts of North America. The word chamaecyparis is derived from the Greek *chamia* (dwarf) and *kuparissos* (cypress). The name nootkatensis relates to Nootka Sound, on Vancouver Island, B.C., where it was discovered. The other two North American species are Atlantic white cedar *(Chamaesyparis thyoides)* and Port Orford cedar *(Chamaesyparis lawsoniana)*.

Distribution The coastal forests from southwestern Alaska through British Columbia to northern California.

The Tree

Alaska cedar is a medium-sized tree, typically ranging from 40-80 feet high and one to two feet in diameter. Trees from Alaska are frequently older than 300 years. Dominant trees can be from 300 to over 700 years old, with a record of over 1,040 years.

General Wood Characteristics

The heartwood is a bright, clear, sulfur yellow. The sapwood is narrow, usually lighter in color, and is often difficult to distinguish from the heartwood. Annual growth rings are faintly visible in flat-grained lumber or rotary-cut veneer and are virtually absent in vertical-grained lumber. The wood has a high oil content and is strongly aromatic. The odor has been described as resembling raw potatoes or turnips and serves to identify Alaska cedar at once. Some people suffer allergic reactions to the foliage or freshly cut wood. Unlike most softwoods, the wood shows no marked difference between earlywood and latewood. This gives the wood a uniform texture and makes it ideal for carving, veneers, joinery, and any product where smooth wear is desirable. The wood is moderately heavy, soft, fine textured, straight grained, easily worked and durable. It is rated as moderate in strength, stiffness, hardness and shock resistance.

Working Properties

The timber of Alaska cedar is readily worked by both hand and machine tools. There is a slight dulling effect on cutting edges, but it usually finishes very well. In lumber with a wavy grain, there is a tendency for the grain to pick up in planing and molding. Nail-holding power is not as good as in other woods of equal density but improves as the wood ages. Alaska cedar glues well under controlled conditions, more easily with resin glues than with nonresin gluing. Tests show that although Alaska cedar laminated with some glues delaminates more readily than other woods for similar densities, it will stand up satisfactorily under weather tests for at least 18 months. Laminated Alaska cedar is acceptable for marine use. Alaska cedar is in the top category of woods on which paints adhere well, when applied correctly, and gives good service. In Alaska, however, some trouble with paint holding on boats has been reported possibly because the wet climate makes it difficult to dry the wood before painting. The natural oil prevents the wood from absorbing oil-based paints readily and the surface must be well-prepared before painting, especially after kiln-drying. More drying time is needed after painting than with most other softwoods.

Alaska cedar has good insulating properties and is more resistant to fire than some species. In tests where 1 5/8-inch thick roof decking was subjected to a gas flame, the average times for flames to burn through were 22 minutes for western Red Cedar, 26 minutes for Douglas-fir, and 44 minutes for Alaska-cedar.

Durability

Alaska cedar is one of the most durable American softwoods.

Preservation

Alaska cedar is resistant to preservative treatment.

Uses

Only a small amount of Alaska cedar now finds its way into domestic markets in the United States and Canada. Most of the annual cut is exported, chiefly to Japan, in the form of cants (squared-off timbers) and logs. Alaska cedar is used where durability, chemical resistance, stability and workability are needed. Used locally for interior trim, furniture, small boat hulls, and canoe paddles. Used commercially for battery separators, bedding for heavy machinery, boat building, bridge and dock decking, carving, cooling towers, framing, furniture, cabinet work, heavy flooring, marine piling, molding, musical instruments, paneling, toys, patterns, sash doors, stadium seats, utility poles, water and chemical tanks, and window boxes.

Because of its durability, resistance to acid, smooth-wearing quality, stability, and workability, Alaska-cedar has a wide variety of uses. Its value in shipbuilding has long been recognized. Indians for the northwest coast of North American carved canoes from it, and Russian colonists of Alaska used it in constructing the hulls of some 20 steamers built at their Sitka shipyards between 1840 and 1863. The wood is now used for canoes, racing shells, skiffs, fishing boats, tugs, scows, barges, and yachts.

It is also used for outdoor items such as signs, garden furniture, greenhouses, window frames and screens, window boxes, stadium seats, power poles, and marine piling. Industrial uses include water tanks, cooling towers, acid-storage tanks, vats, chemical containers, benches, walks, and other uses where contact with acid is likely.

Alaska-cedar is used where severe exposure to weather, heavy traffic and shock loads are encountered, such as for heavy flooring, bridge and dock decking, and bedding for heavy machinery. Other construction uses include framing, roof decking, exposed beams and posts, and concrete forms. Indoors, it is used for molding, sashes, doors, furniture, cabinets, shelving, paneling and flooring. It is also used for canoe paddles, patterns, veneer cores, toys, and musical instruments. Alaska-cedar has been used as a lining for closets and boxes to repel moths. In fact, in the 19th century it was prized in China where it was imported and made into trunks and chests under the name of “camphor wood.” The wood was used in many ways by the northwest Indians of British Columbia and Alaska—for canoes, canoe paddles, totem poles, fishhooks, masks, hats, and rattles. The bark was used in basketry, twisted into string or rope, and mixed with mountain goat wool to be woven into blankets.

RED ALDER *(Alnus rubra)*

The genus *Alnus* is represented by 20-30 species native to North and Tropical America (15) and Eurasia (15). The word *alnus* is the classical Latin name for alder. The *rubra* for_____.

Distribution Pacific coast region from Southeast Alaska southeast to southern California; also locally east to northern Idaho. Red Alder is common throughout Southeast Alaska on stream bottoms with rich, rocky, moist soils and along beaches where creeks enter the sea. On landslides it forms almost impenetrable thickets. Red Alder is a pioneer species on mineral soil, thriving in moist sites. It is common below 1,000 feet elevation and absent at higher elevations, where Sitka alder is frequent. Both species come in along roadsides and where ground is disturbed after logging. They are a problem in road maintenance, requiring continual clearance of shoulders and side slopes.

The Tree This is a small to medium-sized deciduous tree with a height of 20-40 feet and a diameter of 4 to 16 inches.

General Wood Characteristics Both the sapwood and heartwood of red alder are nearly white when freshly cut, and there is little or no visible distinction between the two. Shortly after being cut, the wood changes to a reddish brown and when dry, may appear to be a light yellowish brown. The wood has a fine uniform grain, is smooth textured, and is easy to work. The annual rings are each made up of a comparatively wide band of springwood and a narrow band of summerwood, the summerwood appearing as fine lines in the radial section.

The wood is moderately light in weight, moderately strong in bending (as in a beam) and compression (as in a post), moderately soft, moderate in stiffness, and

moderately low in ability to resist shock. It has little tendency to split when nailed and has moderate nail-holding ability. When properly seasoned, the wood is comparatively stable in all dimensions, and surface checking is not apt to occur in use. Red alder takes and holds stains and paints exceptionally well and glues easily. The wood has low resistance to decay, and in this characteristic is comparable to aspen or white fir. Green lumber is especially vulnerable to organisms producing decay. Unless the green boards are kiln-dried without undue delay or promptly open-piled for air seasoning, they become stained.

Working Properties Red alder is excellent for turning and polishing and takes glue, paint , and stain well.

Durability Rated as slightly or nonresistant to heartwood decay.

Preservation Logs should be processed quickly, particularly during warm weather, as decay proceeds rapidly. If processing must be delayed, the logs should be stored in water. Green number should be carefully stacked for air-drying or promptly kiln-dried to prevent damage from microbial stain.

Uses Of little economic importance in Alaska at present, the primary use of red alder in the Pacific Northwest is for pulpwood. Lumber for furniture manufacture ranks next in importance. Prior to 1950, the furniture industry used nearly 99 percent of the red alder lumber manufactured. Now the figure is closer to 90 percent. The wood has proved very satisfactory for stained or enameled furniture, for the cores of panels faced with more expensive cabinet woods, such as mahogany and black walnut, for turned and shaped parts for low-priced chairs, and for drawer sides, bottoms and ends. Small quantities of red alder are also used for fixtures, general millwork, and handles. The wood is used also in smoking meat and fish and for wood carving.

BLACK COTTONWOOD *(Populus trichocarpa)*

The genus *Populus* is composed of about ___ species native to North America [__] and ____ [__]. The word populus comes from_____. The *trichocarpa* for_____.

Distribution Pacific coast of Southeast Alaska, rare toward southern end and reported from only a few islands; more common from Stikine river north to the head of Lynn Canal along the Dyea, Chilkat, and Klehini Rivers, Glacier Bay, and Yakutat Bay; west to Prince William Sound, Cook Inlet, Susitna Valley, and Kodiak Island. Southern Alaska and southern Yukon Territory south through British Columbia to Montana, Idaho, and California and in mountains to Utah and Baja California. This species is found in lowlands of the coastal forests of Southeast and southern Alaska. It is best developed at lower levels on river bottoms and sandbars, forming pure stands with undergrowth of willows and alders. It is common on the valley floors of the a few large streams, such as the Stikine and Taku rivers. It is very rare on islands.

The Tree This is the largest deciduous tree in Alaska, growing rapidly to a height of 80-100 feet and a diameter of 3 feet.

General Wood Characteristics Light in weight and color with a fairly straight grain and uniform texture, black cottonwood is not a particularly strong wood. Its heartwood is greyish white to light brown, occasionally with darker streaks. It is fine-textured, light weight and soft.

Black Cottonwood is light in weight, weak in bending and compression, moderately limber, soft, moderately low in shock resistance, and has a moderately large shrinkage. It is estimated to rank as moderate in ease of kiln drying, poor in ability to stay in place, easy to glue, and very low in resistance to decay.

Working Properties

Cottonwood is rather difficult to work with tools without producing chipped or fuzzy grain. It is low in nail-holding ability, but does not split easily in nailing. The wood has a good reputation for holding paint. Care must be taken in selecting a suitable priming paint.

Durability

Preservation

Uses

Cottonwood is primarily used in the manufacture of lumber, veneer, plywood core, pulpwood, excelsior, and fuel. The lumber and veneer produced from Cottonwood are generally used for boxes and crates. The light weight of the wood and its ability to take nails without splitting, combined with a good color for stenciling, and lack of odor, make it suitable for a wide variety of containers. The small supply in Alaska is a possible source of paper pulp, veneer, and lumber. Some square-cut logs have been used for cabins.